

2008

Wisconsin Energy Statistics

Highlights

Wisconsin Office of Energy Independence Achieving 25 x '25

Picture 1

The wind turbines are owned and operated by We Energies and are located at Blue Sky Green Field Wind Energy Center in Fond du Lac County. www.we-energies.com/environmental/bluesky_greenfield.htm. The photo is courtesy of We Energies.

Picture 2

The United Community Center's (UCC) 13-kilowatt, fixed-rack solar electric system includes more than 70 solar panels on the roof of the main administration building. The panels produce more than 16,000 kilowatt-hours each year. Students of Bruce-Guadalupe Community School at UCC can track energy savings online. The photo is courtesy of UCC.

Picture 3

The photo is of the Kingsford hydroelectric project, located on the Menominee River in Florence County, Wisconsin and Dickinson County, Michigan, with installed capacity of 7,200 kilowatts. Photo courtesy of We Energies.

Picture 4

The grazing cows represent an energy source compliments of Wisconsin's Dairy State status—cow manure. Manure digesters create methane burned to create electricity. Photo courtesy of the Wisconsin Farm Bureau Federation.

Picture 5

The vehicle being refuelled with E85 ethanol represents Wisonsin's largest home-grown contribution to renewable transportation fuels. Photo courtesy of the Office of Energy Independence.

Picture 6

The forest represents Wisconsin's biggest opportunity for renewable energy for all economic sectors: woody biomass. Photo courtesy of the Biomass Energy Resource Center.

Wisconsin Energy Statistics – Highlights

Jim Doyle

Governor
State of Wisconsin

Judy Ziewacz

Executive Director
Office of Energy Independence

Office of Energy Independence

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In April 2008, I launched the ambitious Clean Energy Wisconsin plan: we will generate 25 percent of our electricity and 25 percent of our transportation fuels from renewable fuels by 2025. We will capture 10 percent of the market share for renewable energy. We will use our state's tremendous research capability to become the country's leader in making alternative energy more affordable and

more available. About one hundred years ago, Wisconsin took charge of its economic future and switched from a grain-based to a dairy-based economy, and became the Dairy State. Another transition is upon us—we can become the Clean Energy State.

Governor Jim Doyle

In 2007, Wisconsinites spent \$21.5 billion on energy, an increase of \$1.9 billion and a new record. At the Office of Energy Independence, we craft policy and work with private business as we travel toward the Governor's goal of 25×25 —the vision we share is of energy that saves money, cleans our air and water, builds jobs and gives us energy independence. The Wisconsin Energy Statistics documents our progress.



Judy Ziewacz, Executive Director

Office of Energy Independence

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Summary of Wisconsin's 2007 Energy Year

Resource energy consumption in Wisconsin increased 4.5 percent in 2007 after decreasing 2.1 percent in 2006. Petroleum use increased 0.3 percent in 2007, after falling by 1.4 percent in 2006. Coal, which is used primarily for electricity generation, increased by 0.3 percent while electricity imports increased to 2005 levels. A hotter summer increased the demand for electricity to run air conditioners, and the demand for natural gas to generate electricity. Energy use was boosted by the Wisconsin economy, which experienced a .5 percent increase in total employment in 2006 and a 2.6 percent increase in the gross state product.

Sector Energy Use

The industrial sector consumed 23.8 percent of all the end use energy used in Wisconsin in 2007 (page 10). Industrial users are primarily dependent on natural gas (41.5 percent) and electricity (30.1 percent) to fuel manufacturing activities such as papermaking, printing and food processing.

The commercial sector used slightly more energy in 2006. End use energy for commercial activities increased by 2.7 percent in 2007. Since 1980, end use energy has increased by 55.4 percent, with electricity use more than double over the same period.

Residential energy use increased 6.7 percent. Natural gas is the dominant fuel used in households, accounting for 48.8 percent of all energy consumed. The residential sector includes energy used in appliances and in space and water heating. Residential use of renewable resources such as wood used for space heating, increased by 15 percent in 2007.

Transportation energy use increased 1.4 percent in 2007 while renewable transportation fuels, such as ethanol mixed with gasoline (E10 and E85) increased by 23.6 percent. The transportation sector includes vehicles such as cars and trucks, railroads, aviation gas and jet fuel, and diesel fuel used in farming.

Expenditures

Total Wisconsin expenditures for energy increased by 9.9 percent in 2007, setting a new record of \$21.6 billion (a \$1.9 billion increase). Expenditures rose across all sectors, with the largest increase in the residential sector of 11.2 percent (\$470 million), followed closely by the transportation sector at 10.9 percent (\$993.7 million).

Weather

Wisconsin climate is showing a warming trend. Winter weather has been warmer than the 30-year normal 17 of the last 18 years. In 2007, there were 8.1 percent fewer heating degree days than the 30-year normal and 7.6 percent fewer heating degree days than 2006. The summers are also getting warmer, which places a burden on the electrical system through increased cooling for space conditioning and food storage. The number of cooling degree days increased 9.8 percent over 2006, and 33.1 percent more cooling degree days than the 30-year normal.

Natural Gas

Natural gas prices, on average, increased 3 percent in 2007, and natural gas use increased 4 percent. Cold winter weather led to a 8.4 percent increase in the residential sector in 2007. There was an increase of 22 percent in natural gas used to generate electricity. Overall, natural gas use has increased more than 29.3 percent since 1990 as access to natural gas increased, and equipment to use natural gas became more pervasive and efficient. The major markets for natural gas in Wisconsin are space heating, industrial processes and electricity generation.

Petroleum

Petroleum use declined in the residential, commericial and industrial sectors, while increasing in the agricultural, transportation and electric utility sectors. More than 83 percent of all petroleum products were used for transportation purposes. Petroleum provides more than 29 percent of Wisconsin's resource energy needs.

The United States imported 64.9 percent of the petroleum it used in 2007, a decrease from 2006. More than 40 percent of these imports came from OPEC countries. World oil production decreased 0.3 percent in 2007, falling short of the record high set in 2005.

Coal and Nuclear

Coal use increased by 0.3 percent in 2007, to 25.9 million tons, and has been the most heavily relied upon fuel in Wisconsin since 1996. Coal accounted for 29.4 percent of all the energy used in 2007 and 59.1 percent of the energy used by Wisconsin utilities and independent power producers to produce electricity. More than 42.4 percent of the coal used in Wisconsin comes from the western part of the nation. Utility coal prices increased 13.4 percent in 2007. In 2007, nuclear power accounted for 21.4 percent of the energy used by Wisconsin's utilities to produce electricity.

Electricity

Electricity sales increased 2.2 percent in 2007. In 2007, the industrial sector was the largest electricity user in Wisconsin, using 35.7 percent. However, the commercial and residential sectors are not far behind, using 32.9 percent and 29.5 percent respectively.

Renewable Energy, Energy Efficiency and the Environment

Renewable energy use increased 10.8 percent in 2007, primarily due to increased use of ethanol, wood, solar and biomass (e.g., paper byproducts). The increase in renewable energy may be in part because all data on renewables has been historically revised to represent renewable energy that:

- meets the definition for renewable energy under Wisconsin law. For example, power generated from burning municipal solid waste and refuse-derived fuels are not included in the biomass figures.
- is metered and used at the point of production or sold to the electrical grid. Previously, this publication included estimates for passive solar power (e.g., daylighting in buildings).

Wood remains Wisconsin's most-used renewable energy resource. Wisconsin's consumption of ethanol increased 23.6 percent In 2007, partly due to the increased availability of ethanol in the state. From August 2007 to August 2008, the number of gas stations selling E85 increased from 67 to 111. In 2007 renewable energy produced more than 304 million kWh of electricity in Wisconsin. Production of electricity from renewable energy sources will increase in the future as Wisconsin utilities comply with the state's renewable energy portfolio standard outlined in 2005 Act 141.

In 2007, two key indices of Wisconsin energy efficiency showed a increase in energy use. These indices were total energy use per \$1,000 of gross state product and electric energy use per \$1,000 gross state product. When comparing Wisconsin's 2005 per capita energy use to the other 49 states and the District of Columbia, Wisconsin is in the middle (28th largest user of 51), with its per capita energy consumption 1.9 percent above the U.S. average.

Carbon dioxide emissions from energy use increased by 1.5 percent. Emissions of carbon dioxide have now increased almost 22.5 percent since the 1990 base year.

Wisconsin Energy Statistics 2008 presents the most current information available on Wisconsin's energy supply system and use patterns. The current edition builds on more than 37 years of continuous energy data collection and analysis by the Wisconsin State Energy Office.

A full compilation of Wisconsin's energy statistics for 2007 can be found at http://power.wisconsin.gov/.

2008 Energy Preview

During 2008, communities across the state put forth efforts to reduce energy consumption, the emerging bioplastic market gained strength, ethanol consumption increased, and schools and businesses converted to wood-burning boilers to save money and use renewable resources.

Energy Use and Prices¹

- In 2008, the highest gas price was \$4.114 per gallon on July 17. The average gas price for 2008 was \$3.289 and the average price for diesel was \$3.821. Using these price averages, Wisconsinites spent approximately \$11.2 billion on transportation fuel in 2008.
- Wisconsin used 108.7 million fewer gallons of gasoline in 2008, a decrease of 4.19 percent.³ The use of ethanol from January to November 2008 increased by 38 percent from 140.6 million gallons in 2007 to 194 million gallons in 2008.
- 2008 saw increases in fuel prices, especially those used for heating, and electricity.
 - Heating oil prices rose 10.4 percent from \$2.69/gallon in 2007 to \$2.97/gallon in 2008.
 - Liquefied Petroleum (LP) Gas prices increased 18 percent from \$1.89/gallon in 2007 to \$2.23/gallon in 2008.
 - Natural Gas prices increased during the summer when gas is purchased and stored by utilities, driving winter gas prices up by 16.5 percent, from \$9.92 per million British thermal units (MMBtu) to \$11.56/MMBtus.
 - Retail electricity prices increased 6.7 percent from \$.1105/kilowatthour (kWh) to \$.1179/kWh.

Ethanol - E10 and E85 in Wisconsin

- A larger percentage of Wisconsin's gasoline is mixed with ethanol. In 2008, 85.2 percent of Wisconsin's gasoline was an ethanol blend, compared to 59.2 percent in 2007.
- From August 2007 to August 2008, the number of gas stations selling E85 (85 percent ethanol and 15 percent gasoline) increased from 67 to 111.

Energy Independent Communities

Wisconsin communities are key players in achieving the Governor's 25 x '25 goals. OEI awarded grants to communities to develop a 25 x '25 plan to evaluate their energy use and determine how to best incorporate renewable energy in their community. Of the 43 applications received, 10 communities were awarded a total of \$400,000.

During 2008, 46 communities committed to 25×25 goals through a formal resolution, and 28 publicly supported adopting a 25×25 resolution.

Bioplastics and Bioproducts

In October 2008, the Wisconsin Office of Energy Independence hosted the first state-sponsored Bioplastics and Composites Conference, drawing interest from around the country. Wisconsin manufacturers have positioned the state in the top ten bioproduct-producing states in the nation. The next bioplastics conference is scheduled for November 2009 in Milwaukee.

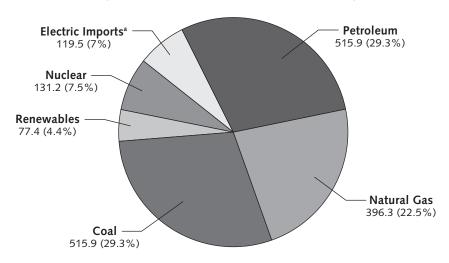
¹ Heating fuel and LP rates are gathered from fuel retailers across the state as part of an OEI telephone survey. Electricity price averages are compiled from rates reported to the Public Service Commission of Wisconsin. Natural Gas rates are compiled from rates reported by utilities on their websites.

² From the American Automobile Association, Daily Fuel Gauge Report. http://www.fuelgaugereport.com/Wlavg.asp

³ Gasoline consumption in millions of gallons, (for 2008, December quantity is estimated): 2007, 2,377,391,834; 2008, 2,277,273,435. A decrease of 100,118,399 gallons. Ethanol consumption for January to November was: 2007, 140,630,135; 2008, 194,039,086. An increase of 53,408,951. **Source:** Wisconsin Department of Revenue, Excise Tax Section.

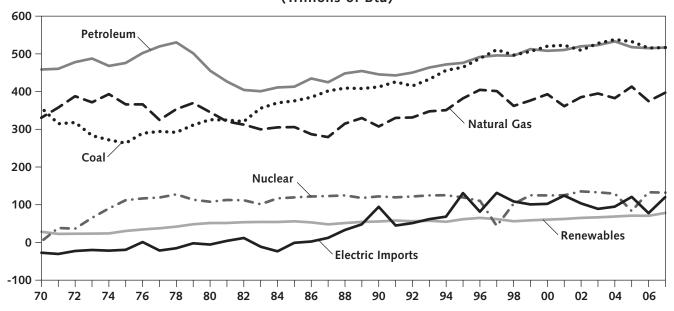
Wisconsin Resource Energy Consumption, by Type of Fuel

2007
(Trillions of Btu and Percent of Total)



Total Energy Consumption: 1,756.1

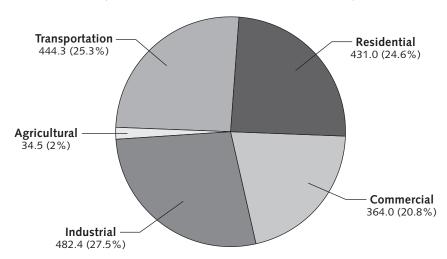
1970-2007 (Trillions of Btu)



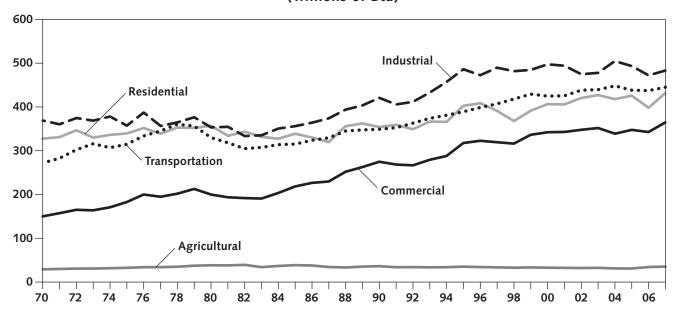
a "Electric imports" is the estimated resource energy used in other states or Canada to produce the electricity imported into Wisconsin. This resource energy is estimated assuming 11,300 Btu of resource energy per kWh imported into Wisconsin. Values below the "0" indicate that resource energy was used in Wisconsin to produce electricity that was exported out of state.

Wisconsin Resource Energy Consumption, by Economic Sector

2007
(Trillions of Btu and Percent of Total)



1970-2007 (Trillions of Btu)

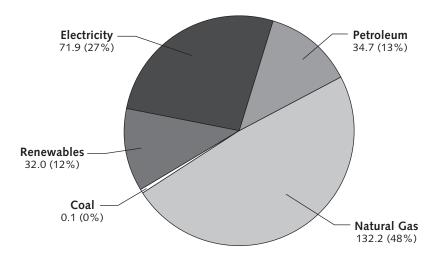


 $\textbf{Source:} \ Wisconsin \ Office \ of \ Energy \ Independence.$

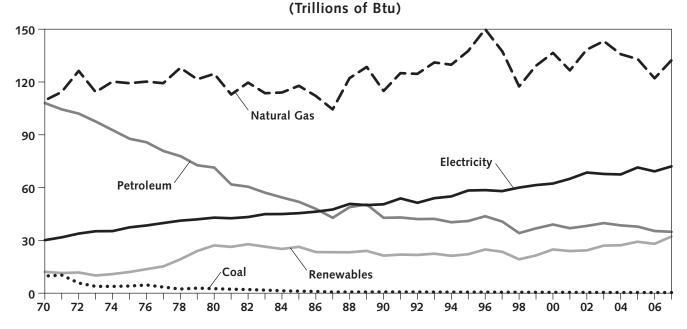
Wisconsin Residential Energy Use, by Type of Fuel

Residential end use energy increased 6.7 percent in 2007. Natural gas continues to be the dominant fuel used in Wisconsin homes, providing almost half of the end use energy used.

 $2007 \\ \text{(Trillions of Btu and Percent of Total)}$



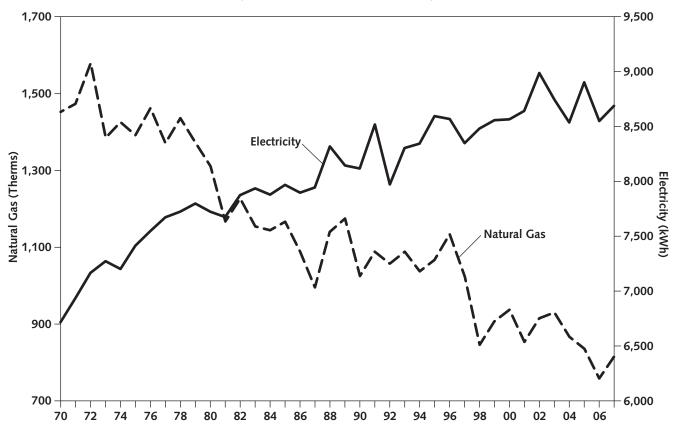
1970-2007



Wisconsin Residential Electricity and Natural Gas Use Per Customer

Electricity use per customer increased 1.6 percent in 2007, while natural gas use increased 7.5 percent.

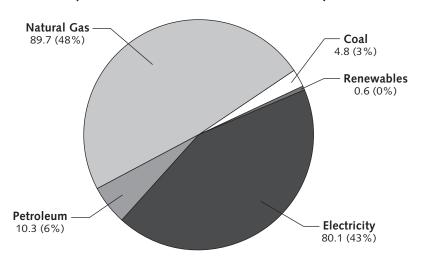
1970-2007 (Kilowatt-hours and Therms)



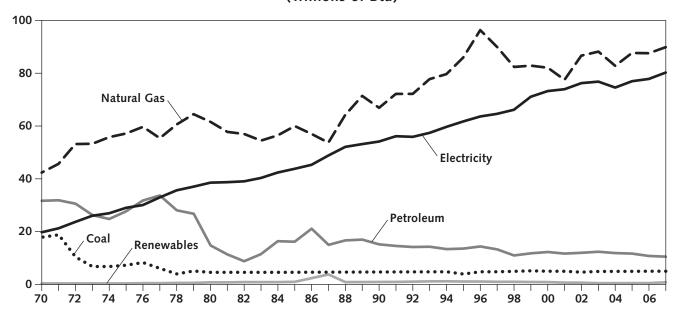
Wisconsin Commercial Energy Use, by Type of Fuel

In 2007, commercial sector energy increased 6.5 percent. Since 1980, commercial end use energy has increased 82.8 percent. Electricity energy use doubled over the same period.

 $2007 \\ \text{(Trillions of Btu and Percent of Total)}$



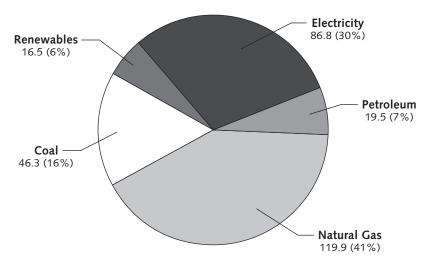
1970-2007 (Trillions of Btu)



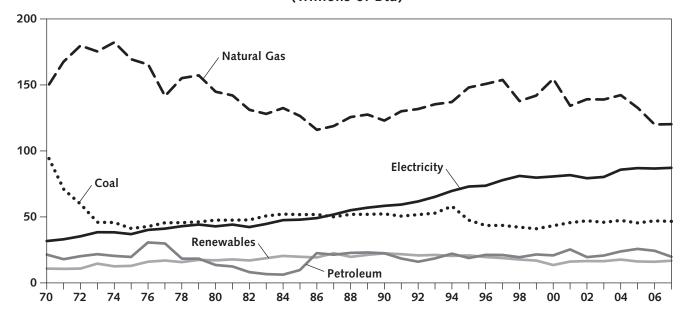
Wisconsin Industrial Energy Use, by Type of Fuel

End use energy consumption in the industrial sector decreased 2.4 percent in 2007. The major industrial energy sources are natural gas and electricity, trailed by coal, petroleum and renewables. While petroleum continues to be the largest end use energy source in Wisconsin, in the industrial sector petroleum use only exceeds renewables.

 $2007 \\ \text{(Trillions of Btu and Percent of Total)}$



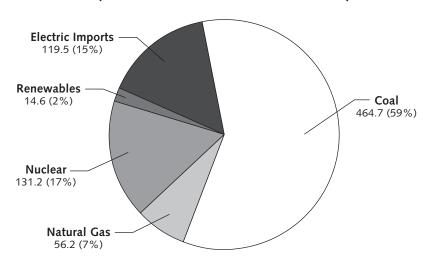
1970-2007 (Trillions of Btu)



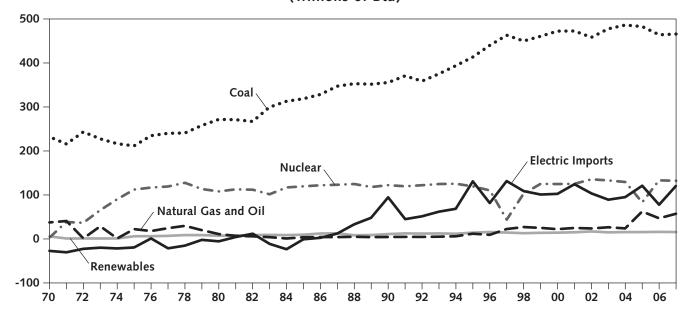
Wisconsin Energy Use for Electricity Generation, by Type of Fuel

A warmer summer, with 9.8 percent more cooling degree days than 2006, increased energy use for electricity generation by 7.3 percent in 2007.

 $2007 \\ \text{(Trillions of Btu and Percent of Total)}$



1970-2007 (Trillions of Btu)

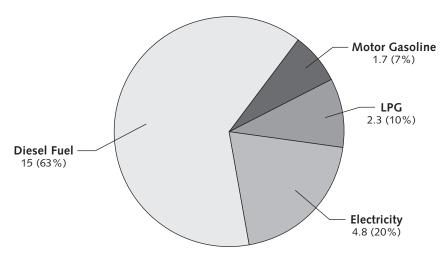


Wisconsin Agricultural Energy Use, by Type of Fuel

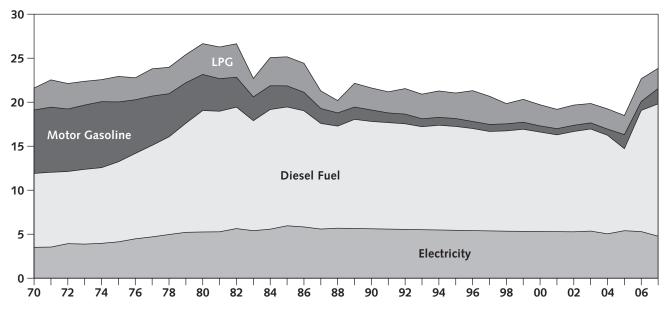
Agricultural energy use is affected by changes in mechanization and automation, and by advances in technology such as biodiesel. Starting in 2005, OEI shifted from a per acre approach to gathering fuel data to new data resources for petroleum fuels.

Although farmers use manure digesters and other forms of energy generation such as biomass, and biodiesel to power and heat their farm, their primary energy comes from petroleum sources.

2007
(Trillions of Btu and Percent of Total)



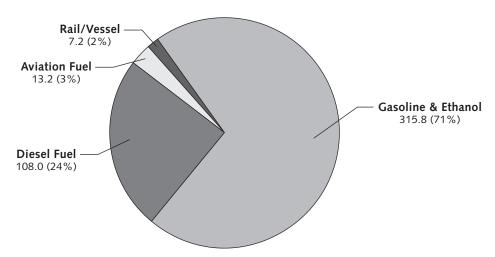
1970-2007 (Trillions of Btu)



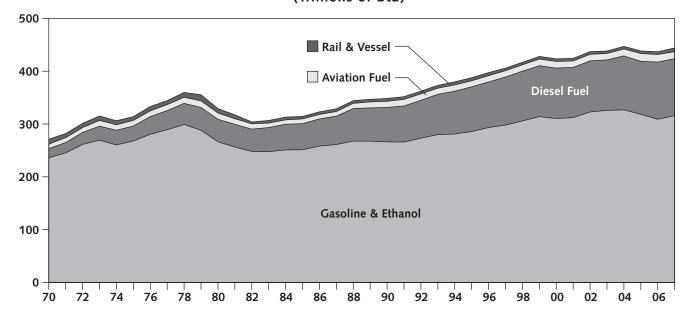
Wisconsin Transportation Energy Use, by Type of Fuel

Transportation energy use increased 1.8 percent in 2007. Motor gasoline use increased 1.5 percent, while ethanol use increased 23.6 percent. Diesel fuel use decreased 0.3 percent. The increase in ethanol consumption in Wisconsin is due in part to the availability of ethanol, E10 and E85, across the state. From August 2007 to August 2008, the number of gas stations selling E85 increased by 66 percent, from 67 to 111.

2007
(Trillions of Btu and Percent of Total)

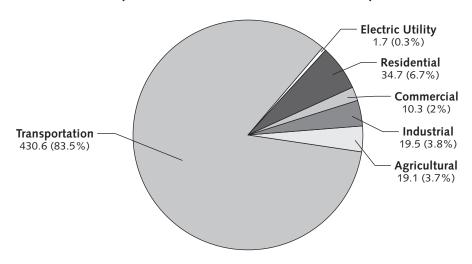


1970-2007 (Trillions of Btu)



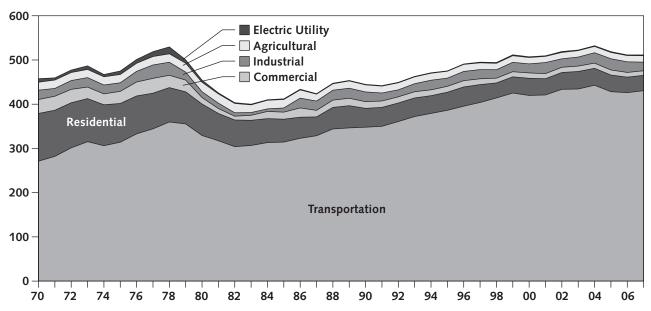
Wisconsin Petroleum Use, by Economic Sector

 $2007 \\ \text{(Trillions of Btu and Percent of Total)}$



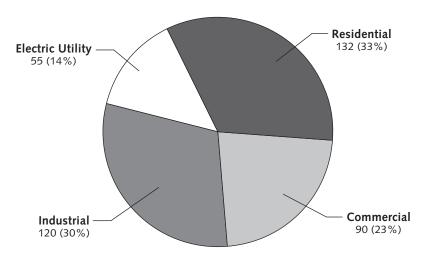
1970-2007

(Trillions of Btu)

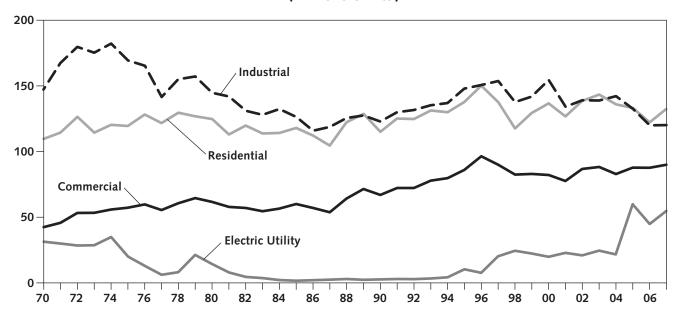


Wisconsin Natural Gas Use, by Economic Sector

 $2007 \\ \text{(Trillions of Btu and Percent of Total)}$

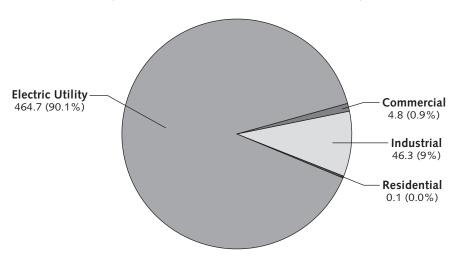


1970-2007 (Trillions of Btu)

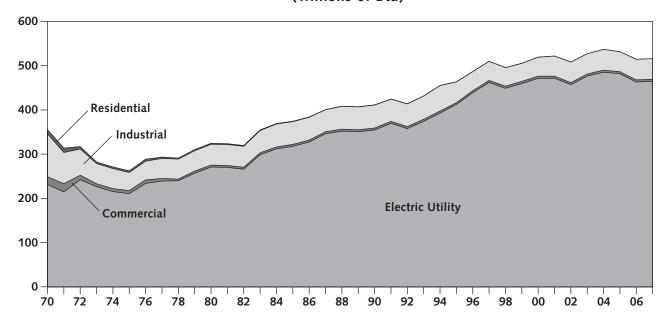


Wisconsin Coal Use, by Economic Sector

 $2007 \\ \text{(Trillions of Btu and Percent of Total)}$

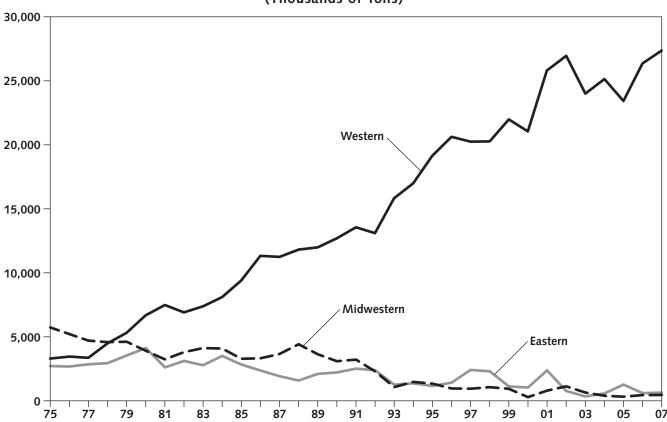


1970-2007 (Trillions of Btu)



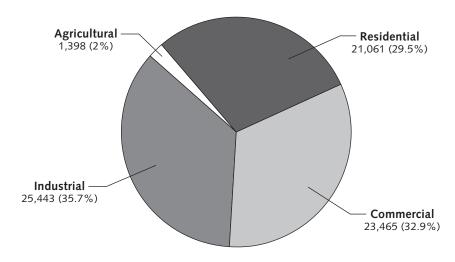
Coal Deliveries to Wisconsin Power Plants, by Region of Origin

1975-2007 (Thousands of Tons)

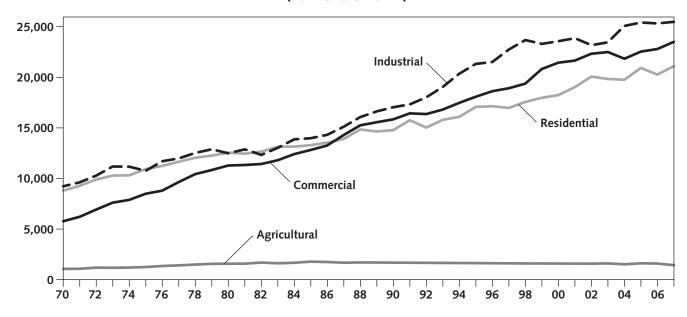


Wisconsin Electric Utility Sales, by Economic Sector

2007 (Millions of kWh and Percent of Total)

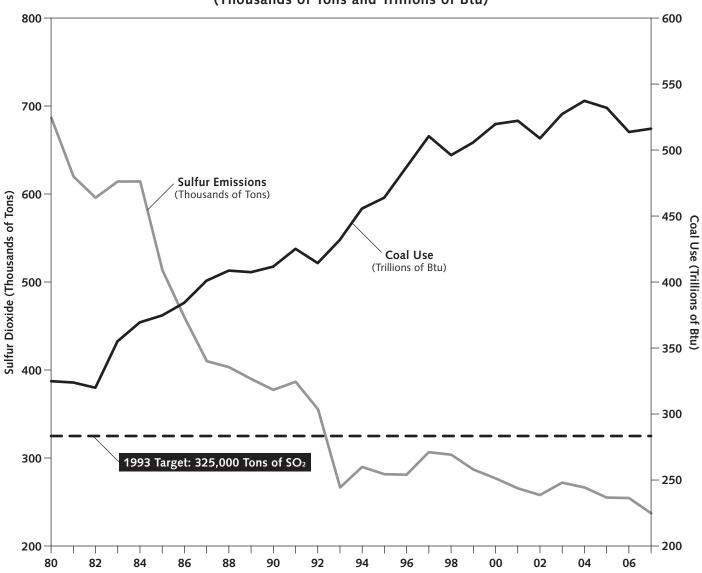


1970-2007 (Millions of kWh)



Wisconsin Sulfur Dioxide Emissions and Coal Use

 $1980 \hbox{--} 2007$ (Thousands of Tons and Trillions of Btu)



Wisconsin Carbon Dioxide Emissions from Energy Production

Wisconsin's CO₂ emissions from energy increased 1.5 percent in 2007. Since 1990, total CO₂ emissions have increased 22.5 percent. 2007 levels of CO₂ emissions are slightly higher than 2000 levels.

1980-2007 (Millions of Tons and Pounds per Million Btu) **Total Emissions** 150 Pounds CO₂/MMBtu (Million Tons) O 105 WW 100 W 95 Pounds Per Million Btu -138 1980-2007 1.4 Index: 1980 = 1.0 1.3 **Total Emissions** 1.2 Pounds Per Million Btu 1.1 1.0

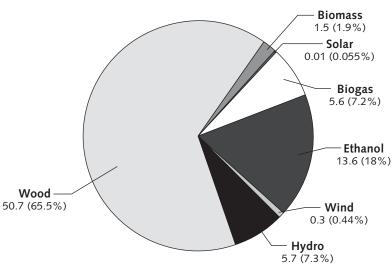
Source: Wisconsin Office of Energy Independence.

0.9 +

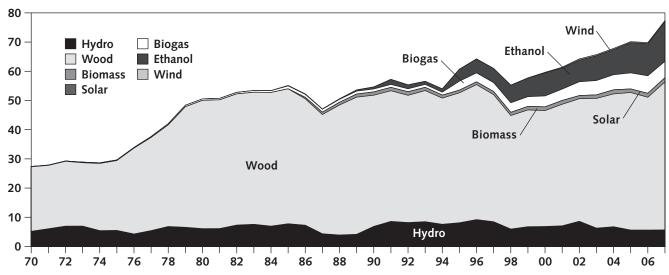
Wisconsin Renewable Energy Use, by Type of Fuel

Renewable energy use in Wisconsin increased 10.8 percent in 2007. In 2007, ethanol use in the transportation sector increased 23.6 percent. Hydro generation includes electricity generation by Wisconsin utilities and dams owned by industrial users (e.g., paper mills). All the figures for solar energy, biomass and biogas have been historically revised to more accurately represent a revision to methodology and data sources. For example, this page *does not* include estimated passive solar, municipal solid waste or other refuse derived fuels (e.g., railroad ties, tires), as it has in previous publications.

 $2007 \\ \text{(Trillions of Btu and Percent of Total)}$



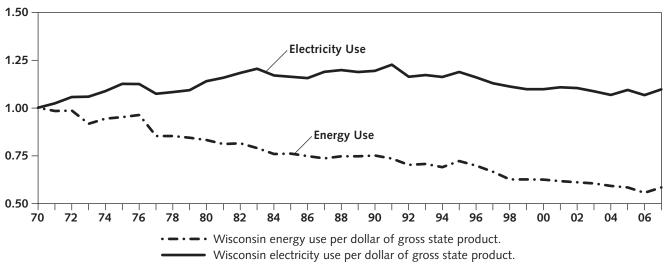
1970-2007



Indices^a of Wisconsin Energy Efficiency 1970-2007

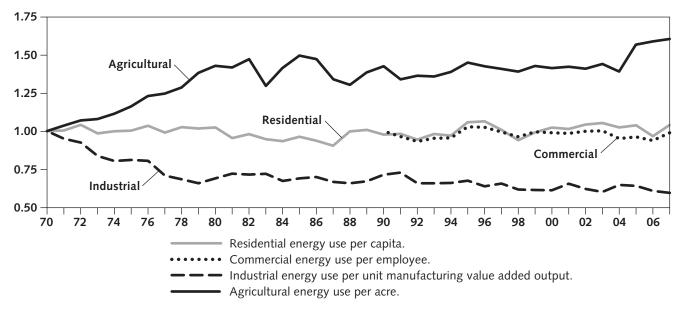
Energy and Electricity Use Per Dollar of Gross State Product

Index: 1970 = 1.0



Energy Indices by Economic Sector

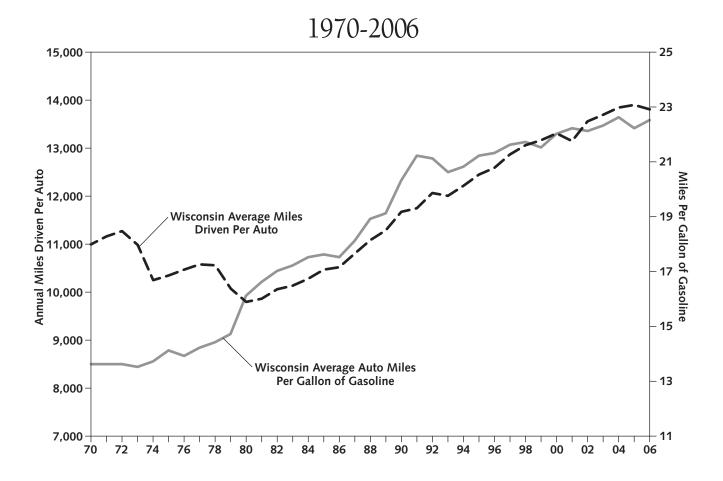
Index: 1970 = 1.0



^a All data, except commercial employment data, normalized to 1.0 in 1970, an arbitrary baseline to which all other years can be compared. Commercial employment data normalized to 1990, when industrial codes changed from SIC to NAICS.

Average Miles Driven Per Auto and Average Auto Miles Per Gallon of Gasoline in Wisconsin

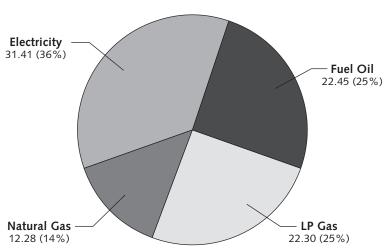
The average number of miles driven annually per automobile in Wisconsin decreased slightly in 2006. It is nearly 41 percent higher than in 1980 and 11 percent higher than the U.S. average. Fuel efficiency has been relatively stagnant since 1991 because of the increasing number of less fuel efficient large cars sold each year. Wisconsin cars were nearly 67 percent more fuel efficient in 2006 than in 1973. Improved mileage since 1999 may be due to new cars able to burn ethanol.



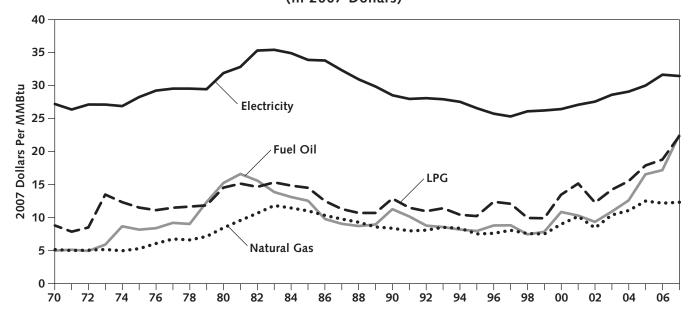
Wisconsin Residential Energy Prices, by Type of Fuel

In 2007, residential energy prices increased for each fuel type: liquid propane (LPG) (22.1 percent), natural gas (3.8 percent), heating oil (34.4 percent) and electricity (2 percent). The last four columns in the table below show the same prices after adjusting for inflation.



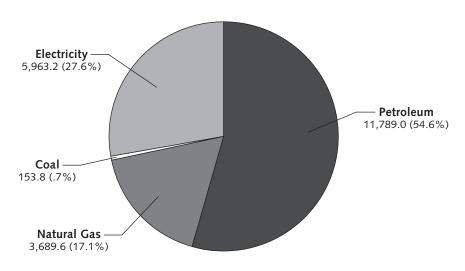


1970-2007 (in 2007 Dollars)

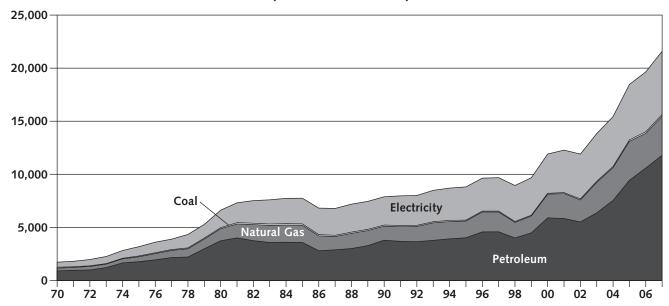


Wisconsin End Use Energy Expenditures, by Type of Fuel

2007
(Millions of Dollars and Percent of Total)

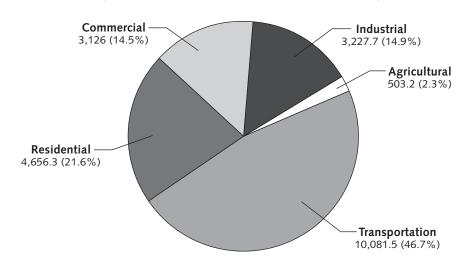


1970-2007 (Millions of Dollars)

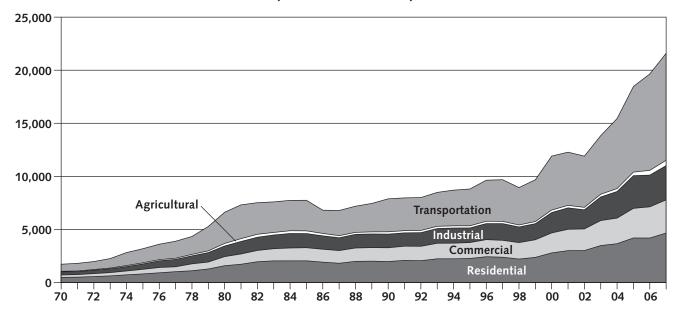


Wisconsin End Use Energy Expenditures, by Economic Sector

2007
(Millions of Dollars and Percent of Total)



1970-2007 (Millions of Dollars)



Wisconsin Population-Weighted Heating Degree Days, Cooling Degree Days and Normal

There were 8.1 percent fewer heating degree days in 2007 than the normal and 7.6 percent more than in 2006. From 2000 to 2007, there was an average of 7,122 heating degree days, 7.5 percent fewer than the 30-year normal. Using cooling degree days as an index, the summer of 2007 was warmer than the summer of 2006, with 9.8 percent more cooling degree days. In 2007, the number of cooling degree days was 33.1 percent above the normal.



